TASK-TECHNOLOGY FIT ASSESSMENT OF AN EXPERTISE TRANSFER SYSTEM

THESIS

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Abstract

Organizations today are using information technology to capture knowledge from experts and disseminate this knowledge to decision makers. Having the right information to the right person at the right time facilitates more effective and efficient decisions. This study uses Goodhue's (1998) Task-Technology Fit (TTF) theoretical model to evaluate an Expertise Transfer Forum (ETF) developed by the Oklahoma State University for the Defense Ammunition Center's quality assurance personnel. The preliminary findings suggest a good fit between the ETF and problem-solving tasks assigned to students in the DAC classroom environment. The participants also offered the following observations:

- The ETF was more suited to the field environment because of the knowledge content
- They would only use the ETF if they had a question they could not get the answer to
- The ETF transcripts, videos, and nugget views were easy to use
- There should be more training on the use of the ETF
- Searching using the views was not as easy as a simple keyword search
- Expert vetting would enhance the currency and trust in the knowledge
- Interviewing instructors instead of and/or in addition to the field experts
- Technical issues in this study included video buffering lag and some views that did not open

Because of the small N and the specific nature of the ETF content, there was not enough statistical power to generalize our findings. Overall, the findings from this study suggest when populated with current and applicable knowledge, the ETF is a viable tool.

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I. Introduction

Overview

Organizations today are using information technology to capture knowledge from experts and disseminate this knowledge to decision makers. Having the right information to the right person at the right time facilitates more effective and efficient decisions (Long and Long, 2001). Information forms by adding contextual, categorical, and/or calculated meaning to basic data (Davenport and Prusak, 2000). People gain knowledge through experience with information and gain insight when comparing it with other experiences they remember. Knowledge creation is in the minds of the knowledge holders, and it is refined when applied to different situations. Davenport and Prusak (2000) define knowledge as "…a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information."

Organizational knowledge representation is through not only policies or repositories but also in non-documented routines, processes, practice, and norms (Davenport and Prusak, 2000). In an effort to capture organizational expert knowledge and transfer it to non-expert interns, the Defense Ammunition Center (DAC) commissioned the development of an online tool that captures knowledge within a

meaningful contextual framework and displays this knowledge back to a knowledge seeker. The DAC mission is to “provide the military services timely ammunition training, demilitarization technology, explosives safety, engineering, career management, and technical assistance though logistics support” (DAC, 2008). DAC teamed with Oklahoma State University (OSU) to develop an Expertise Transfer Forum (ETF) to meet DAC’s knowledge management requirements. The ETF captures expert ammunition knowledge, organizes this knowledge into “nuggets”, and indexes these nuggets to allow users to search for pertinent topics. The current knowledge content in the ETF focuses on expert knowledge and lessons learned from Quality Assurance Specialists Ammunition Surveillance (QASAS) personnel returning from site visits. Access to the ETF is gained easily though an Internet connection and user accounts are administered as a quality and security measure. The knowledge nuggets are then utilized during the development and revision of ammunition curriculum, during course lectures, mission planning, and QASAS use in the field. The purpose of this study is to evaluate the ETF developed by Oklahoma State University for the DAC QASAS personnel. The questions this paper will address are:

1. Does the ETF fit the problem-solving tasks in the DAC classroom?

Methodology

This paper will answer the research questions by having students evaluate the ETF during a problem-solving exercise. This evaluation will utilize a 7-point Likert-scale survey using Task-Technology Fit (TTF) constructs along with open-ended

questions on the overall forum. A field experiment strategy was chosen to maximize specific user evaluations and unobtrusiveness.

Scope

This thesis will examine a knowledge transfer system using the TTF model within the confines of a DAC QASAS classroom environment. Students from a single ammunition course will be given problem-solving scenarios and individually find solutions utilizing the ETF. An OSU representative will administer an ETF familiarization session, facilitate the scenario exercise, and gather survey results from the students.

Significance

Currently, a variety of transfer mediums are used at DAC due to a mixture of teaching environments such as: face-to face instructor-led classrooms, computer-based training (CBT), and on-site/in-the-field direct utilization visits. The ETF's purpose is to improve the transfer of knowledge by reaching a larger population with richer mediums and knowledge that is more current. This study hopes to assess and refine the data collection process and integrity of the study protocol used to evaluate the ETF. A small-scale field experiment will help assess the logistics of a full-scale implementation of the ETF within DAC. The researchers hope to gain enough data to decide whether to go ahead with a full-scale implementation and study.

Thesis Overview

In the following chapters, a literature review will establish the theoretical background behind knowledge management, knowledge transfer, and task-technology fit that will set the stage for the methodology of this study. Next, the method and model utilized to test the proposition will be discussed. This paper will conclude with an analysis of the survey data, discussion of the results, review of the limitations, and recommendations for future research.

II. Background

Knowledge Management

The knowledge management movement is credited with getting businesses to focus on the something other than data. Knowledge and information are often mixed within knowledge repositories and forums, but most organizations can distinguish the difference between knowledge and data (Davenport and Prusak, 2000). "Information is converted to knowledge once it is processed in the mind of individuals and knowledge becomes information once it is articulated and presented in the form of text, graphics, words, or other symbolic forms" (Alavi and Leidner, 2001). A shared knowledge base is required for people to understand data or information consistent with the knowledge holder.

> "…systems designed to support knowledge in organizations may not appear radically different from other forms of information systems, but will be geared toward enabling users to assign meaning to information and to capture some of their knowledge in information and /or data" (Alavi and Leidner, 2001).

It is with this understanding of information and knowledge systems and our users shared common knowledge base that we will evaluate our knowledge system using models that have been useful in evaluating information systems.

Knowledge Transfer

Davenport and Prusak (2000: p 101) break knowledge transfer into a basic formula: Transfer = Transmission + Absorption (and Use). Transmission is the sending, presenting, or displaying of knowledge to a recipient. Since transmission does not

guarantee the receipt of the knowledge, we also measure the absorption of the knowledge (and subsequent use). Many efforts in knowledge transfer have focused on the speed and population size of dissemination (velocity). However, to have quality absorption of the knowledge, knowledge transfer systems should also focus on the viscosity of the knowledge being transferred. Viscosity is influenced by factors like transfer mediums, and dilution away from the original knowledge (Davenport and Prusak, 2000). Multiple channels of knowledge and mediums increase the success of knowledge transfer, to include face-to-face time with experts (Davenport and Prusak, 2000).

User Evaluation of Technology

MIS research has seen a variety of user evaluation models to help provide detailed diagnostics of information systems and services. The model used should pinpoint specific areas that are not meeting the needs of the user. A good model should go beyond a basic usefulness or satisfaction score but also help guide corrective actions that will increase the effectiveness and efficiency of the user in a particular task (Goodhue, 1998). User evaluations are described in a variety of ways: user attitudes, information satisfaction, MIS appreciation, information channel disposition, value, and usefulness. No matter what it is called, they are all measuring if the task needs are met, and how the use of the system influences the user's performance (Goodhue, 1992).

Two Theories of TTF

Goodhue (1995) states, "Since there are so many different underlying constructs, it is probably not possible to develop a single general theoretical basis for user evaluation". He suggests identifying a theoretical viewpoint and linking systems to their

impact using a user evaluation. Goodhue (1995) developed a TTF model to "suggest that a user will give higher evaluations based not only on inherent characteristics of a system, but also on the extent to which that system meets their task needs and their individual abilities." TTF is an objective quantity that analyzes the user-evaluated fit between task needs and system functionalities (Goodhue, 1992).

Two Task-Technology Fit theories exist, and they vary in the type of users and the technology utilized in completing decision-making tasks (Gebauer, Shaw, and Gribbins, 2005). Zigurs and Buckland (1998) apply the TTF concept to Group Support Systems (GSS) technology and the tasks needs of a team of users. Goodhue (1998) stresses the importance of the interaction between the task needs of the individual user and organizational information system functionality.

Zigurs and Buckland's TTF.

Zigurs and Buckland (1998) developed a theory of task/technology fit in Group Support System (GSS) environments based on attributes of task complexity and their relationship with collaborative technologies. Its intention is not to encompass all tasks, but the kinds of tasks that are typically encountered in organizational decision-making groups. The TTF for GSS identified five categories of group tasks (simple, problem, decision, judgment, and fuzzy) and three collaborative technology support dimensions (communication, process structuring, information processing support) (Gebauer et al, 2005).

Task non-routineness in this model is the combination of task structure (tasks variability, number of exceptions) and task difficulty (analyzability and predictability).

Task interdependence is defined as the degree to which a task is related to other tasks and organizational units, and the extent to which coordination with other organizational units is required (Zigurs, Buckland, Connolly, and Wilson, 1999). This TTF model applies a functional view of technology and proposes the software will be used if the functions available to the user support the activities of the user (Dishaw and Strong, 1999).

Multiple studies have utilized Zigurs and Buckland's TTF model for evaluating GSS in organizational group tasks (Zigurs, 1999; Zigurs and Khazanchi, 2007; Murphy and Kerr, 2000; Shirani, Tafti, and Affisco, 1999), with mobile technologies (Gebauer et al, 2005), in environments with cultural differences (Massey, Montoya-Weiss, Hung, and Ramesh, 2001), and in comparing it to other models like Fit-Appropriation Model (Dennis, Wixom, and Vandenberg, 2001), and Technology Acceptance Model (Dishaw and Strong, 1999). Many of these studies found GSS technologies and environments to be well suited for creative and idea generation tasks but a poor fit for negotiation and intellectual tasks (Murphy and Kerr, 2000).

Goodhue's TTF.

Goodhue's (1998) TTF model assumes that information systems offer some value by facilitating a decision-making process and users will evaluate their experience with the systems based on the value they perceive. "Thus, the strongest link between information systems and performance impacts will be due to a correspondence between tasks needs and system functionality (task-technology fit)" (Goodhue, 1998). System use changes as the abilities and needs of the user change, and well-made systems will change to meet the needs of the user (Goodhue, 1998).

The TTF from Goodhue (1998, 1995) and Goodhue and Thompson (1995) is the basis for assessing organizational information systems and services as they affect a user's managerial decision-making tasks. This TTF describes technology as a tool used by an individual to perform a task, and the technology characteristics are evaluated on the degree to which they meet the task needs. The user evaluation is made along a continuum from positive to negative based on their experience with the systems (Goodhue, 1995).

TTF is an excellent model for developing a diagnostic tool for information systems and services. A variety of studies have confirmed the validity of the TTF in evaluating information systems in general (Goodhue, 1992; Goodhue, 1995; Goodhue, 1998; Goodhue and Thompson, 1995), for IT security (Angolano, 2008), for mobile technologies (Gebauer et al, 2005), and user computer self-efficacy (Strong, Dishaw, and Bandy, 2006). The TTF has also been melded with other models like Technology Acceptance Model (Dishaw and Strong, 1999), and Ease of Use (Mathieson and Keil, 1998) and has been found a valid basis for organizational information systems evaluations.

Figure 1 shows the basic TTF model modified to reflect knowledge tasks and systems with the antecedents of Knowledge Task Characteristics, User Characteristics, and Knowledge Systems and Services. The dotted lines show there is a moderating effect from Knowledge Task and User Characteristics on the Knowledge Systems and Services. Goodhue and Thompson (1995) understand that no system provides perfect data to complete complex task decision, so as tasks become more complex the system will offer less functionality and decrease the TTF. Changes to the knowledge tasks that require the

user to make greater demands on the knowledge systems should decrease the TTF. Likewise, changes to the knowledge systems (appropriate functionality or policies for the task) will increase the TTF. Overall, as the gap between the requirements of a knowledge task and the functionalities of a knowledge technology widen, the TTF is reduced (Goodhue, 1992). "This model guides us away from thinking about particular systems characteristics or policies as being good or bad in themselves, encouraging us instead to rate systems as good or bad in relation to a task or set of tasks" (Goodhue, 1992).

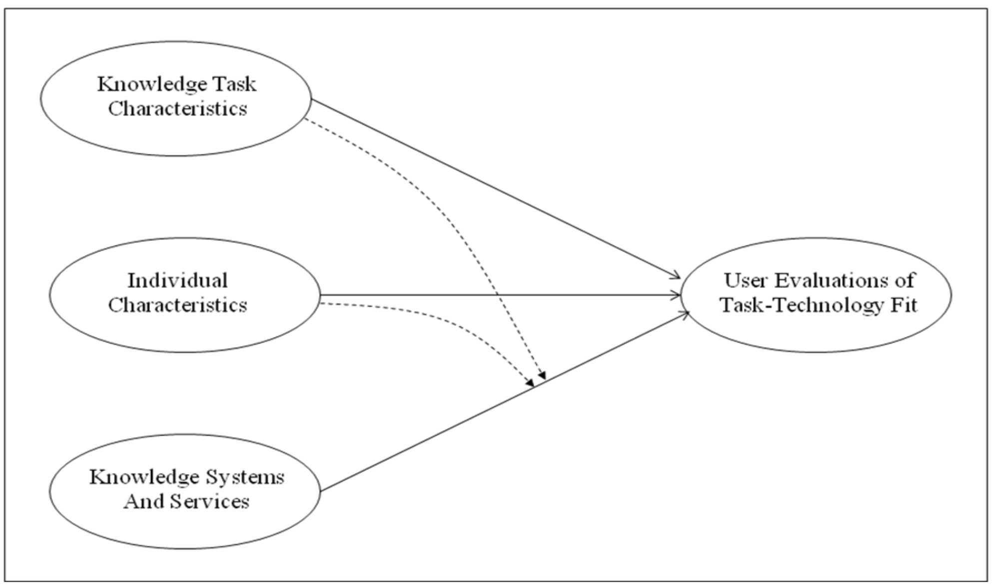


Figure 1 – Knowledge Task-Technology Fit (TTF) Model (adapted from Goodhue, 1998)

<u>Knowledge Task Characteristics</u>

Tasks are actions carried out by individuals to turn inputs into outputs (Goodhue & Thompson, 1998). Some knowledge tasks may rely more heavily on certain aspects of IT especially if answering unpredictable or never before seen questions which is the forte

of knowledge management systems (Angolano, 2008). Goodhue and Zigurs TTF models agree in the description of tasks depending on their complexity (non-routineness and interdependence). Questions on task characteristics developed in Goodhue's survey center around these concepts to help determine the task complexity. Studies have found that individuals engaged in more non-routine (complex) tasks rated IS lower since they make more demands on these systems and are more acutely aware of their shortcomings (Goodhue and Thompson, 1995). The goal of TTF is to evaluate the degree to which knowledge systems support users in decision-making tasks. Goodhue (1998) describes task as the process by which users come to use recorded knowledge for making decisions. It is decision-making that the knowledge systems must support and the anticipation of this process that users consider in their decision to use or not use a knowledge system (Goodhue, 1998).

The decision-making process starts with identification (or the decision to pursue certain knowledge), acquisition of the knowledge (manual or computer-based), and then the interpretation of the knowledge to the context of the decision that needs to be made (Goodhue, 1998). These steps are not necessarily executed sequentially (interpretation may lead to the identification of other needed knowledge before making a decision). The knowledge system should be defined in a way that is appropriate for the task being supported. The TTF evaluation does not measure how accurate knowledge is, but whether it is accurate enough for the user to complete the task at hand. The user evaluation questions focus on a user's experience with the system, rather than their general knowledge of the system (Goodhue, 1992).

Individual Characteristics

A user is an individual who uses recorded organizational knowledge in decision-making tasks. These individuals have computer literacy abilities that allow them to use the technologies to perform their tasks (Goodhue, 1998). These computer literacy abilities vary among users and include training, IT experience, and are assessed through their comfort levels with creating spreadsheets, generating unique reports, or writing simple applications (Goodhue, 1995). Asking questions in the context of their own experiences with performing decision-making tasks allows them to base the answer on firsthand experience, making them a qualified and presumably reasonably accurate informant (Goodhue, 1992).

Knowledge Systems and Services Characteristics

Goodhue (1998) demonstrated 12 separate dimensions of system and services

Table 1. Knowledge Systems and Services (adapted from Goodhue, 1998)

Accessibility	Ease of access to knowledge, authorization to access knowledge
Accuracy	Correctness of the knowledge
Assistance	Ease of getting help utilizing the system
Compatibility	Ease with which information from different sources can be compared without inconsistencies
Confusion	Understanding of the knowledge
Currency	How current is the knowledge
Ease of Use	Hardware and Software ease of use
Locatability	Ease of determining what knowledge is available and where
Meaning	Ease of determining elements within the system
Presentation	Representation of knowledge
Right Level of Detail	Maintaining knowledge at the right level of detail
System Reliability	Dependability of access and uptime of the system

within the TTF model (Table 1). To measure the degree to which a system or systems environment has a desirable set of characteristics, questions are developed to reflect the factors that will lead to successful systems (Goodhue, 1992). Overall, the TTF model is intended to be general enough to focus on either the impacts of a specific system or the more general impacts of the entire set of systems, policies, and services (Goodhue and Thompson, 1995).

Technology-to-Performance Chain (TPC)

Goodhue and Thompson (1995) extended the TTF into the Technology-to-Performance Chain (TPC) that not only had the user evaluation of the technology against a task, but also had the user's assess their performance when utilizing the technology to complete the task. Staples and Seddon (2004) tested the TPC Model and found that the user evaluation will change depending on the mandatory versus voluntary use of the technology. In a later paper, Goodhue (1998) stated, "While performance is the desired bottom line, performance measures tend to be unidimensional, and as such are not very useful as a diagnostic (knowing only that performance is low does not give much insight into what actions might improve the situation)". The assessment of performance in the TPC relies on the user's ability to assess both their performance and the technology impact on that performance.

The focus of this paper is the student problem-solving (task) to technology (ETF) fit within the confines of a scenario-based field experiment setting. While performance will be assessed, it will not be able to follow the constructs of the TPC model, but it is

well suited for the TTF model. Our goal is to evaluate the ETF in such a way as to be generalizable to other knowledge transfer processes within the DAC organization.

Expertise Transfer Forum (ETF)

In organizations, knowledge is deemed useful when it leads to a change in behavior or the development of new ideas that engender new behaviors. Instead of starting with large, all-inclusive knowledge management systems, Davenport and Prusak (2000) suggest introducing small pilot projects to build a knowledge-friendly organizational culture. The ETF fits this description and continuous improvements to the forum include content expansion, expert vetting, user suggested improvements, and adding multiple channels for knowledge transfer. There is no single instrument that can capture all the needs of a user evaluation within the confines of a non-operational student evaluation, but with the utilization of the TTF Model, we hope to measure the effectiveness of the ETF for DAC knowledge transfer use in the classroom.

Information is transformed into knowledge by utilizing the 4 C's: comparisons, consequences, connections, and conversations (Davenport and Prusak, 2000). The knowledge nuggets categorized and indexed within the ETF follow these 4 C concepts to create a medium to transfer knowledge from one person to another. Comparison is the recognition of patterns and the ability to see how information from one situation compares to other situations. ETF Experts compare nuggets with categorized situations and are able to compare and contrast the usefulness of the nugget within a variety of situations. Consequences deals with the implications information has in making decisions and actions based on the knowledge. Through lessons learned, experts

document the cause and effect of decisions based on their knowledge at the time. With retrospection, these experts are able to determine what additional knowledge would have been beneficial in that situation. How knowledge relates to other information or knowledge is making connections. Gaining other people's perspectives about information gleans knowledge through conversations. Knowledge is matured and solidified through the expert review and validation process within the ETF where fine points are clarified and differences in perspective and opinion are negotiated.

The ETF presents expert knowledge in a variety of transfer mediums to reach a variety of learning environments and styles. To help resolve difficult problems, the expert's contact information is included in the ETF. The four ETF knowledge elements include knowledge representations (causal maps, workflow diagrams, contextual framing); formatting (user interface, colors); Media (video, images, captions); and indexing (related links, keyword search, course topics, tags, ratings, comments). The additional and continuous subject matter expert vetting of the knowledge nuggets increases the validity of the knowledge and adds insight into different contexts that similar knowledge can be applied. The technology of the online ETF enables faster access to knowledge sources, develops an expertise network map, and opens communications channels, described as important aspects of knowledge transfer (Alavi and Leidner, 2001).

Previous research of this ETF consisted of determining the social ecology of the organization and its role in the success of this particular knowledge transfer initiative. The research suggested that the unique characteristics of knowledge management systems should reflect the unique social nature of knowledge management when utilizing models

such as TTF. It found the DAC culture conducive to knowledge sharing and the knowledge concepts of creation, storage/retrieval, transfer, and application becoming ingrained into the culture of the organization (Moseley, 2008). With these concepts in mind, we proposed the following proposition:

Proposition: The ETF fits the problem-solving tasks assigned to students in the DAC classroom environment.

Chapter Overview

This chapter discussed the principles behind knowledge management, knowledge transfer, and reviewed previous research on the Expertise Transfer Forum created for DAC. It also explained the concepts behind two different task-technology models and the factors that dictate in what environments to use the models. We chose the Goodhue Task-Technology Fit (TTF) model to conduct our research because it best represented the decision-making knowledge tasks the ETF facilitates. The next chapter will review our methodology of conducting the research using the TTF model.

III. Methodology

Introduction

There is no perfect research method the will guarantee success, but there are strategies that will assist the research in choosing the most appropriate method for their research problem (McGrath, 1982). McGrath (1982) describes eight distinct research strategies that are generic classes of research settings for gaining insight on a problem. These strategies reside in four quadrants that lie along two continuum lines of Obtrusive-to-Unobtrusive Operations and Universal-to-Particular Behavior Systems. The strategy we employed in our research was the field experiment. The field experiment is a "one-step compromise toward unobtrusiveness in the interest of increasing precision with respect to behavior. (McGrath, 1982). Instead of injecting the ETF into regular day-to-day managerial decision-making processes, our study injected common scenarios that guided the participants down certain decision paths so they could experience all aspects of the ETF. This small compromise in unobtrusiveness differentiates our field experiment from a true field study that would have participants evaluated the ETF in real decisions in their work processes. McGrath (1982) describes the Actor, Behavior, and Context as the three points of maximum concern when deciding on a research methodology. Our field experiment context (C) strives to increase precision Behavior (B) but lacks generalizability to other actors (A). With this in mind, since our research attempts to maximize specific user evaluations it may not be easily applied to a different set of users.

Survey Design

This field experiment will answer the research questions by having students evaluate the ETF during a problem-solving exercise. The survey questions will focus on individual perceptions of the value added to each students learning utilizing the ETF. This survey will utilize a 7-point Likert scale survey using Task-Technology Fit (TTF) constructs including open-ended questions (Appendix A) on the overall forum using example survey questions from Goodhue's research (1998, 1995).

Goodhue (1998) selected dimensions of TTF using the identifying-accessing-interpreting task model, and those dimensions were operationalized with specific questions. He found that these theoretical constructs existed independent of their measures (as opposed to assuming that the measures define the constructs). Therefore, each questionnaire item is an imperfect indicator of its underlying construct, and to add strong validity multiple questions for the same construct are not only possible but also desirable (Goodhue, 1998). The survey design has randomly ordered questions to strengthen the reliability of the Cronbach's alpha. This also lessened the prevalence of anchoring and adjusting, or the influencing of an answer based on a response to another questions (Dooley, 2001). Each question took the form of a user's declarative statement stating that needs were either being met, or not being met along a 7-point agree-disagree scale. "Agree-disagree questions are one of the most frequently used types of questions in social science research and have been shown to have stronger validity than several other types of questions" (Goodhue, 1998). Rewording of Goodhue's example questions

achieved a more accurate description of the knowledge transfer environment inside the DAC classroom.

Goodhue (1998) reviewed the measurement validity and discriminant validity of the TTF and found it is an effective organizational diagnostic device. To achieve this it must be multidimensional assessment that separately and validly measures each dimension (Goodhue, 1998). Internal consistency was heightened by requiring all respondents to fill out the same instrument. The same survey developed for this paper will be given to all the participants to ensure internal consistency. Reliability concerns are addressed by measuring constructs with multiple questions addressing a single construct.

Survey Data Collection

The research in this paper will study the ETF evaluation process and will be conducted at the Defense Ammunition Center (DAC), specifically within the confines of a DAC QASAS classroom environment. An OSU representative will spend a day teaching instructors and students how to use the ETF and ensure every participants has access to the online system before the exercise begins. DAC provides approximately 58 training courses in a variety of disciplines, but since the ETF content currently consists of expert QASAS experts and their job knowledge and experiences, students from one QASAS Ammunition class were chosen to participate in the preliminary evaluation of the ETF. Each student will work alone on problem-solving scenarios, and find solutions utilizing the ETF within a specified timeframe. Five scenarios with five to seven questions each vary in difficulty from simple to complex to mimic the different ranges of

decision-making tasks. Students complete an evaluation survey of their experiences and they will be tracked through random identification numbers that will be controlled by the OSU representative to ensure privacy and non-repudiation.

Survey Analysis

The data analysis will begin by testing the discriminant validity and reliability of the TTF model through the Cronbach's alpha reliability coefficient test. Then, a Confirmatory Factor Analysis will test the construct validity, and a Pearson Correlation matrix will test the correlation between variables. Next, significance levels will be determined to test the reliability, followed by review of the qualitative data from the open-ended questions. Due to the small number participants, statistical data may not show true levels of significance.

Chapter Overview

This goal of this study is to gain enough data to be able to do a full-scale implementation and study of the ETF. By incorporating the design of the well-established TTF model, we are attempting to minimize risks associated with misapplication of research techniques, statistical violations, and inappropriate inference and interpretation of data collection results (Hair, Black, Babin, Anderson, and Tatham, 2006). This study will also assist us in assessing and refining the data collection process and the overall integrity of the study protocol used to evaluate the ETF. The next chapter will focus on the results obtained from the surveys.

IV. Results and Analysis

Models are an attempt to structure our perception of reality and to represent graphical understanding for others (Goodhue and Thompson, 1995). The TTF model has shown theoretical strength in assessing decision-making using information systems within an organization. Our study was able to obtain evaluation surveys from eleven participants, which represented 100 percent of our chosen sample. A more statistically robust analysis would include a larger sample size, so the following analysis may not depict the most relevant factors of our study (Turner, 2006). This section describes the areas of data analysis and because of our small sample size, may fall short of producing results consistent with accepted levels of significance.

Discriminant Validity and Reliability

Discriminant validity and reliability of the constructs were tested using Cronbach's Alpha as recommended by Hair et al (2006). Cronbach's alpha reliability coefficient is a 0 to 1 ranged measure with acceptable lower limits of .70 (exploratory research may lower the acceptable limit to .60). Reliability tests of a variable or set of variables are consistent with the intended item being measured. Goodhue's TTF model has been proven to have strong validity that confirms that the measures are correlated, distinct, and results accurately predict other theoretical concepts. Table 2 shows the descriptive statistics and Cronbach's alpha reliability coefficients for our study. Individual characteristics and knowledge systems and services reached above the acceptable level lower limit of .70, while knowledge task characteristics reached above .60. The results of this reliability test are a reflection of the sample size and a larger

sampling could increase the reliability of this test. This test suggests adequate justification to run a full-scale evaluation using the TTF theoretical model.

Table 2. Scale Descriptive Statistics and Cronbach's Alpha Reliability Coefficients

	Number of Items	Mean	SD	Cronbach's Alpha
Knowledge Task Characteristics	4	4.318	1.762	0.614
Individual Characteristics	3	4.273	1.941	0.860
Knowledge Systems and Services	26	4.797	1.669	0.906

Construct Validity

Confirmatory Factor Analysis (CFA) tests how well variables represent the constructs and it allows researchers to either confirm or reject a theory (Hair et al, 2006). The strength of CFA lies in establishing construct validity, or the extent to which a set of measured items actually reflects the theoretical latent construct those items are designed to measure (Hair et al, 2006). The Eigenvalue also called the latent root is the column sum of squared loadings and represents the amount of variance accounted for by a factor. "The rationale for the latent root criterion is that any individual factor should account for the variance of at least a single variable if it is to be retained for interpretation" (Hair et al, 2006: p. 120). Latent root values greater than 1 are significant and values less than 1 are disregarded.

Table 3 defines the abbreviations used in the statistical tables, and Table 4 shows the rotated component matrix for the individual characteristics, knowledge task characteristics, and overall of the TTF model evaluation. Significant eigenvalues were

Table 3. Abbreviation Definitions.

Abb.	Term
TC1	Task Characteristics 1
TC2	Task Characteristics 2
TC3	Task Characteristics 3
TC4	Task Characteristics 4
IC1	Individual Characteristics 1
IC2	Individual Characteristics 2
IC3	Individual Characteristics 3
ACC1	Accessibility 1
ACC2	Accessibility 2
ACR1	Accuracy 1
ACR2	Accuracy 2
AST1	Assistance 1
AST2	Assistance 2
COM1	Compatibility 1
COM2	Compatibility 2
COM3	Compatibility 3
CON1	Confusion 1
CON2	Confusion 2
CUR1	Currency 1
CUR2	Currency 2
CUR3	Currency 3
EOU1	Ease of Use of Hardware and Software 1
EOU2	Ease of Use of Hardware and Software 2
LOC1	Locatability 1
LOC2	Locatability 2
MNG1	Meaning 1
MNG2	Meaning 2
PRS1	Presentation 1
PRS2	Presentation 2
LOD1	Right Level of Detail 1
LOD2	Right Level of Detail 2
REL1	System Reliability 1
REL2	System Reliability 2
DV	Overall User Evaluation

found for three components with the first component showing the most components factored together and the only component to factor with the dependent variable. Other factored components include task characteristics 1 with 4, and task characteristics 2 with 3. The separate factoring of the task and individual characteristics with the dependent variable may suggest a disconnect between the overall task-technology fit of the study. The responses to the open-ended questions later in this section suggest the division may be due to the particular content within the ETF being geared toward field operations and not the classroom environment of the participants. This study is limited in its statistical power by the small sample size, so further research with a larger N could show differences in significance.

Table 4. Rotated Component Matrix on Individual and Knowledge Task Characteristics

	Component		
	1	2	3
TC1 (Task Char)	.199	.873	.095
TC2 (Task Char)	.227	-.192	.901
TC3 (Task Char)	-.228	.503	.754
TC4 (Task Char)	.036	.811	-.038
IC1 (Individual Char)	.712	.285	.327
IC2 (Individual Char)	.794	.386	-.200
IC3 (Individual Char)	.937	.107	.085
DV (User Evaluation)	.816	-.280	-.004

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization (a Rotation converged in 5 iterations)

Table 5 shows the rotated component matrix for the knowledge systems and services of the TTF model. Significant eigenvalues were found for five components with the first component showing the most components factored together. Other factored components were compatibility with confusion, compatibility with currency, currency

with reliability, and assistance with level of detail. The second question pertaining to confusion did not account for the variance of any other variable so it may need rewording or not be included in further surveys.

Table 5. Rotated Component Matrix on Knowledge Systems and Services

	Component				
	1	2	3	4	5
ACC1 (Accessibility)	.941	-.076	-.074	-.228	.042
ACC2 (Accessibility)	.844	-.464	.113	-.075	.147
ACR1 (Accuracy)	.910	.255	-.103	.176	.059
ACR2 (Accuracy)	.739	-.302	.240	.213	.263
AST1 (Assistance)	.772	-.267	.080	-.262	.298
AST2 (Assistance)	.344	.395	-.002	.167	.784
COM1 (Compatibility)	-.239	.878	.256	.272	.039
COM2 (Compatibility)	-.218	.186	.847	.377	.068
COM3 (Compatibility)	-.130	.581	.768	-.032	-.206
CON1 (Confusion)	-.178	.875	.190	.307	.049
CON2 (Confusion)	-.342	.500	.628	.456	.046
CUR1 (Currency)	-.033	.252	.094	.921	-.037
CUR2 (Currency)	.250	-.067	.798	.015	-.018
CUR3 (Currency)	.217	.122	.849	.001	.322
EOU1 (Ease of Use)	.819	-.164	-.024	-.389	.346
EOU2 (Ease of Use)	.771	-.318	-.052	-.485	.186
LOC1 (Locatability)	.773	.083	.222	.295	.188
LOC2 (Locatability)	.874	-.079	.105	-.319	.269
MNG1 (Meaning)	.954	-.163	-.034	-.053	.026
MNG2 (Meaning)	.941	-.234	.114	-.074	.161
PRS1 (Presentation)	.831	-.371	-.020	-.342	.076
PRS2 (Presentation)	.897	-.344	-.097	-.030	.095
LOD1 (Level of Detail)	.291	-.187	.193	-.182	.872
LOD2 (Level of Detail)	.770	-.088	-.013	.299	.517
REL1 (Reliability)	-.129	.169	.177	.949	.042
REL2 (Reliability)	.913	.201	-.040	-.123	.040

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization (a Rotation converged in 6 iterations)

Correlation Analysis

Pearson correlation analysis generates a linear matrix that shows the relationship between two variables represented by a coefficient of correlation, *r*. A *r* closer to 1 or -1 shows a strong linear relationship between the two variables, while a *r* near or equal to 0 signifies little to no relationship (McClave and Sincich, 2006). A positive *r* indicates that as one variable increases the other increases, and a negative *r* signifies that as one variable increases the other decreases. The closer the correlation is to 1 or -1, the stronger the scale reliability of the true concept measurement (McClave and Sincich, 2006). The overall Pearson Correlation Matrix in Table 6 shows a positive correlation between knowledge system and services and the user evaluation. This suggests that an increase in knowledge systems and services will show an increase in the user evaluation. The matrix also shows a 0.05 correlation between knowledge systems and services and individual characteristics. This suggest that an increase in user computer efficacy will

Table 6. Pearson Correlation Matrix (Overall)

		TC	IC	KS	DV
TC (Knowledge Task Characteristics)	Pearson Correlation	1	0.109	0.150	-0.142
	Sig. (2-tailed)	.	0.749	0.659	0.678
	N	11	11	11	11
IC (Individual Characteristics)	Pearson Correlation	0.109	1	.649*	0.505
	Sig. (2-tailed)	0.749	.	0.031	0.114
	N	11	11	11	11
KS (Knowledge Systems and Services)	Pearson Correlation	0.150	.649*	1	.806**
	Sig. (2-tailed)	0.659	0.031	.	0.003
	N	11	11	11	11
DV (User Evaluation)	Pearson Correlation	-0.142	0.505	.806**	1
	Sig. (2-tailed)	0.678	0.114	0.003	.
	N	11	11	11	11

**Correlation is significant at the 0.01 level (2-tailed)
*Correlation is significant at the 0.05 level (2-tailed)

show an increase in knowledge systems and services.

The Pearson correlation matrix sections I through VI (Table 7-12) indicate no

Table 7. Pearson Correlation Matrix for Variables (Section I)

		TC1	TC2	TC3	TC4	IC1	IC2	IC3	ACC1	ACC2	ACR1	ACR2
TC1	Pearson Correlation	1	0.030	0.401	0.639*	0.346	0.468	0.200	-0.024	0.117	0.300	0.507
	Sig. (2-tailed)	.	0.931	0.222	0.034	0.298	0.146	0.556	0.945	0.732	0.370	0.112
	N	11	11	11	11	11	11	11	11	11	11	11
TC2	Pearson Correlation	0.030	1	0.438	-0.093	0.316	-0.113	0.236	0.420	0.202	0.374	0.300
	Sig. (2-tailed)	0.931	.	0.178	0.786	0.343	0.741	0.484	0.199	0.551	0.257	0.370
	N	11	11	11	11	11	11	11	11	11	11	11
TC3	Pearson Correlation	0.401	0.438	1	0.292	0.224	-0.079	-0.036	-0.351	-0.443	-0.097	-0.153
	Sig. (2-tailed)	0.222	0.178	.	0.383	0.508	0.817	0.916	0.289	0.172	0.777	0.653
	N	11	11	11	11	11	11	11	11	11	11	11
TC4	Pearson Correlation	0.639*	-0.093	0.292	1	0.102	0.153	0.200	-0.321	-0.189	0.103	-0.018
	Sig. (2-tailed)	0.034	0.786	0.383	.	0.765	0.654	0.556	0.337	0.578	0.763	0.957
	N	11	11	11	11	11	11	11	11	11	11	11
IC1	Pearson Correlation	0.346	0.316	0.224	0.102	1	0.679*	0.662*	0.194	0.323	0.139	0.520
	Sig. (2-tailed)	0.298	0.343	0.508	0.765	.	0.022	0.027	0.569	0.333	0.683	0.101
	N	11	11	11	11	11	11	11	11	11	11	11
IC2	Pearson Correlation	0.468	-0.113	-0.079	0.153	0.679*	1	0.730**	0.309	0.586	0.199	0.725**
	Sig. (2-tailed)	0.146	0.741	0.817	0.654	0.022	.	0.011	0.354	0.058	0.558	0.012
	N	11	11	11	11	11	11	11	11	11	11	11
IC3	Pearson Correlation	0.200	0.236	-0.036	0.200	0.662*	0.730**	1	0.534	0.653*	0.540	0.575
	Sig. (2-tailed)	0.556	0.484	0.916	0.556	0.027	0.011	.	0.091	0.029	0.086	0.065
	N	11	11	11	11	11	11	11	11	11	11	11
ACC1	Pearson Correlation	-0.024	0.420	-0.351	-0.321	0.194	0.309	0.534	1	0.872**	0.819**	0.735**
	Sig. (2-tailed)	0.945	0.199	0.289	0.337	0.569	0.354	0.091	.	0.000	0.002	0.010
	N	11	11	11	11	11	11	11	11	11	11	11
ACC2	Pearson Correlation	0.117	0.202	-0.443	-0.189	0.323	0.586	0.653*	0.872**	1	0.633*	0.862**
	Sig. (2-tailed)	0.732	0.551	0.172	0.578	0.333	0.058	0.029	0.000	.	0.037	0.001
	N	11	11	11	11	11	11	11	11	11	11	11
ACR1	Pearson Correlation	0.300	0.374	-0.097	0.103	0.139	0.199	0.540	0.819**	0.633*	1	0.586
	Sig. (2-tailed)	0.370	0.257	0.777	0.763	0.683	0.558	0.086	0.002	0.037	.	0.058
	N	11	11	11	11	11	11	11	11	11	11	11
ACR2	Pearson Correlation	0.507	0.300	-0.153	-0.018	0.520	0.725**	0.575	0.735**	0.862**	0.586	1
	Sig. (2-tailed)	0.112	0.370	0.653	0.957	0.101	0.012	0.065	0.010	0.001	0.058	.
	N	11	11	11	11	11	11	11	11	11	11	11
AST1	Pearson Correlation	0.039	0.352	-0.280	-0.194	0.418	0.452	0.678*	0.862**	0.842**	0.678*	0.695*
	Sig. (2-tailed)	0.910	0.288	0.405	0.568	0.200	0.163	0.022	0.001	0.001	0.022	0.018
	N	11	11	11	11	11	11	11	11	11	11	11
AST2	Pearson Correlation	0.543	0.041	0.218	0.226	0.092	0.035	0.000	0.298	0.246	0.495	0.365
	Sig. (2-tailed)	0.084	0.904	0.520	0.503	0.789	0.918	1.000	0.373	0.466	0.122	0.270
	N	11	11	11	11	11	11	11	11	11	11	11
COM1	Pearson Correlation	0.383	0.247	0.803**	0.419	-0.042	-0.300	-0.286	-0.378	-0.602	-0.007	-0.293
	Sig. (2-tailed)	0.245	0.464	0.003	0.199	0.902	0.369	0.393	0.252	0.050	0.983	0.381
	N	11	11	11	11	11	11	11	11	11	11	11
COM2	Pearson Correlation	0.544	0.151	0.795**	0.588	0.380	0.336	0.303	-0.399	-0.221	-0.156	0.014
	Sig. (2-tailed)	0.084	0.657	0.003	0.057	0.248	0.312	0.365	0.224	0.514	0.646	0.967
	N	11	11	11	11	11	11	11	11	11	11	11
COM3	Pearson Correlation	0.179	0.576	0.895**	0.220	0.242	-0.041	0.100	-0.212	-0.317	-0.082	-0.107
	Sig. (2-tailed)	0.598	0.064	0.000	0.515	0.474	0.906	0.771	0.531	0.343	0.811	0.754
	N	11	11	11	11	11	11	11	11	11	11	11
CON1	Pearson Correlation	0.426	0.257	0.817**	0.388	0.005	-0.233	-0.180	-0.311	-0.576	0.107	-0.266
	Sig. (2-tailed)	0.191	0.446	0.002	0.239	0.989	0.490	0.596	0.353	0.064	0.754	0.429
	N	11	11	11	11	11	11	11	11	11	11	11
CON2	Pearson Correlation	0.607*	0.263	0.889**	0.541	0.198	0.023	-0.105	-0.490	-0.457	-0.190	-0.078
	Sig. (2-tailed)	0.048	0.434	0.000	0.085	0.560	0.946	0.759	0.126	0.158	0.576	0.820
	N	11	11	11	11	11	11	11	11	11	11	11

**Correlation is significant at the 0.01 level (2-tailed)
*Correlation is significant at the 0.05 level (2-tailed)

Table 8. Pearson Correlation Matrix for Variables (Section II)

		TC1	TC2	TC3	TC4	IC1	IC2	IC3	ACC1	ACC2	ACR1	ACR2
CUR1	Pearson Correlation	0.793**	0.017	0.360	0.828**	0.054	0.144	0.076	-0.252	-0.229	0.223	0.091
	Sig. (2-tailed)	0.004	0.960	0.277	0.002	0.875	0.674	0.824	0.455	0.498	0.510	0.789
	N	11	11	11	11	11	11	11	11	11	11	11
CUR2	Pearson Correlation	0.162	0.335	0.288	0.496	0.331	0.295	0.568	0.129	0.306	0.149	0.236
	Sig. (2-tailed)	0.634	0.313	0.391	0.121	0.320	0.379	0.068	0.705	0.361	0.661	0.485
	N	11	11	11	11	11	11	11	11	11	11	11
CUR3	Pearson Correlation	0.486	0.540	0.673*	0.123	0.621*	0.473	0.460	0.202	0.304	0.181	0.516
	Sig. (2-tailed)	0.130	0.086	0.023	0.719	0.041	0.142	0.154	0.551	0.363	0.595	0.104
	N	11	11	11	11	11	11	11	11	11	11	11
EOU1	Pearson Correlation	-0.109	0.148	-0.389	-0.275	0.346	0.399	0.619*	0.860**	0.817**	0.667*	0.600
	Sig. (2-tailed)	0.751	0.664	0.237	0.414	0.297	0.225	0.042	0.001	0.002	0.025	0.051
	N	11	11	11	11	11	11	11	11	11	11	11
EOU2	Pearson Correlation	-0.269	0.080	-0.485	-0.489	0.231	0.413	0.565	0.852**	0.843**	0.541	0.573
	Sig. (2-tailed)	0.425	0.814	0.130	0.127	0.494	0.207	0.070	0.001	0.001	0.086	0.065
	N	11	11	11	11	11	11	11	11	11	11	11
LOC1	Pearson Correlation	0.461	0.087	0.045	0.199	0.297	0.478	0.661*	0.579	0.636*	0.777**	0.612*
	Sig. (2-tailed)	0.154	0.800	0.897	0.558	0.375	0.137	0.027	0.062	0.036	0.005	0.045
	N	11	11	11	11	11	11	11	11	11	11	11
LOC2	Pearson Correlation	-0.030	0.189	-0.274	-0.234	0.374	0.463	0.668*	0.861**	0.826**	0.700*	0.653*
	Sig. (2-tailed)	0.931	0.577	0.414	0.488	0.257	0.152	0.025	0.001	0.002	0.016	0.029
	N	11	11	11	11	11	11	11	11	11	11	11
MNG1	Pearson Correlation	0.101	0.297	-0.405	-0.205	0.188	0.425	0.542	0.955**	0.919**	0.788**	0.820**
	Sig. (2-tailed)	0.768	0.375	0.217	0.544	0.580	0.193	0.085	0.000	0.000	0.004	0.002
	N	11	11	11	11	11	11	11	11	11	11	11
MNG2	Pearson Correlation	0.133	0.173	-0.338	-0.111	0.311	0.586	0.731**	0.903**	0.937**	0.767**	0.795**
	Sig. (2-tailed)	0.696	0.610	0.309	0.745	0.351	0.058	0.011	0.000	0.000	0.006	0.003
	N	11	11	11	11	11	11	11	11	11	11	11
PRS1	Pearson Correlation	-0.183	0.130	-0.529	-0.329	0.324	0.532	0.679*	0.876**	0.877**	0.586	0.659*
	Sig. (2-tailed)	0.590	0.703	0.094	0.323	0.331	0.092	0.022	0.000	0.000	0.058	0.028
	N	11	11	11	11	11	11	11	11	11	11	11
PRS2	Pearson Correlation	0.073	0.033	-0.525	-0.146	0.295	0.623*	0.704**	0.869**	0.889**	0.717**	0.750**
	Sig. (2-tailed)	0.831	0.923	0.097	0.669	0.379	0.041	0.016	0.001	0.000	0.013	0.008
	N	11	11	11	11	11	11	11	11	11	11	11
LOD1	Pearson Correlation	0.282	-0.028	-0.064	0.043	0.541	0.464	0.336	0.352	0.479	0.210	0.513
	Sig. (2-tailed)	0.402	0.935	0.851	0.899	0.086	0.150	0.312	0.289	0.136	0.536	0.107
	N	11	11	11	11	11	11	11	11	11	11	11
LOD2	Pearson Correlation	0.535	-0.104	-0.204	0.205	0.314	0.618*	0.571	0.654*	0.719**	0.744**	0.748**
	Sig. (2-tailed)	0.090	0.760	0.547	0.545	0.348	0.043	0.067	0.029	0.013	0.009	0.008
	N	11	11	11	11	11	11	11	11	11	11	11
REL1	Pearson Correlation	0.828**	-0.167	0.349	0.828**	0.040	0.214	-0.007	-0.378	-0.240	0.052	0.098
	Sig. (2-tailed)	0.002	0.623	0.293	0.002	0.908	0.528	0.983	0.252	0.478	0.880	0.773
	N	11	11	11	11	11	11	11	11	11	11	11
REL2	Pearson Correlation	0.041	0.432	-0.235	-0.049	0.145	0.133	0.456	0.877**	0.701**	0.854**	0.590
	Sig. (2-tailed)	0.906	0.185	0.488	0.887	0.670	0.697	0.158	0.000	0.016	0.001	0.056
	N	11	11	11	11	11	11	11	11	11	11	11
DV	Pearson Correlation	0.013	0.309	-0.370	-0.023	0.285	0.384	0.751**	0.882**	0.847**	0.835**	0.649*
	Sig. (2-tailed)	0.970	0.355	0.263	0.947	0.395	0.243	0.008	0.000	0.001	0.001	0.031
	N	11	11	11	11	11	11	11	11	11	11	11

**Correlation is significant at the 0.01 level (2-tailed)
*Correlation is significant at the 0.05 level (2-tailed)

Table 9. Pearson Correlation Matrix for Variables (Section III)

		AST1	AST2	COM1	COM2	COM3	CON1	CON2	CUR1	CUR2	CUR3	EOU1	EOU2
TC1	Pearson Correlation	0.039	0.543	0.383	0.544	0.179	0.426	0.607*	0.793**	0.162	0.486	-0.109	-0.269
	Sig. (2-tailed)	0.910	0.084	0.245	0.084	0.598	0.191	0.048	0.004	0.634	0.130	0.751	0.425
	N	11	11	11	11	11	11	11	11	11	11	11	11
TC2	Pearson Correlation	0.352	0.041	0.247	0.151	0.576	0.257	0.263	0.017	0.335	0.540	0.148	0.080
	Sig. (2-tailed)	0.288	0.904	0.464	0.657	0.064	0.446	0.434	0.960	0.313	0.086	0.664	0.814
	N	11	11	11	11	11	11	11	11	11	11	11	11
TC3	Pearson Correlation	-0.280	0.218	0.803**	0.795**	0.895**	0.817**	0.889**	0.360	0.288	0.673*	-0.389	-0.485
	Sig. (2-tailed)	0.405	0.520	0.003	0.003	0.000	0.002	0.000	0.277	0.391	0.023	0.237	0.130
	N	11	11	11	11	11	11	11	11	11	11	11	11
TC4	Pearson Correlation	-0.194	0.226	0.419	0.588	0.220	0.388	0.541	0.828**	0.496	0.123	-0.275	-0.489
	Sig. (2-tailed)	0.568	0.503	0.199	0.057	0.515	0.239	0.085	0.002	0.121	0.719	0.414	0.127
	N	11	11	11	11	11	11	11	11	11	11	11	11
IC1	Pearson Correlation	0.418	0.092	-0.042	0.380	0.242	0.005	0.198	0.054	0.331	0.621*	0.346	0.231
	Sig. (2-tailed)	0.200	0.789	0.902	0.248	0.474	0.989	0.560	0.875	0.320	0.041	0.297	0.494
	N	11	11	11	11	11	11	11	11	11	11	11	11
IC2	Pearson Correlation	0.452	0.035	-0.300	0.336	-0.041	-0.233	0.023	0.144	0.295	0.473	0.399	0.413
	Sig. (2-tailed)	0.163	0.918	0.369	0.312	0.906	0.490	0.946	0.674	0.379	0.142	0.225	0.207
	N	11	11	11	11	11	11	11	11	11	11	11	11
IC3	Pearson Correlation	0.678*	0.000	-0.286	0.303	0.100	-0.180	-0.105	0.076	0.568	0.460	0.619*	0.565
	Sig. (2-tailed)	0.022	1.000	0.393	0.365	0.771	0.596	0.759	0.824	0.068	0.154	0.042	0.070
	N	11	11	11	11	11	11	11	11	11	11	11	11
ACC1	Pearson Correlation	0.862**	0.298	-0.378	-0.399	-0.212	-0.311	-0.490	-0.252	0.129	0.202	0.860**	0.852**
	Sig. (2-tailed)	0.001	0.373	0.252	0.224	0.531	0.353	0.126	0.455	0.705	0.551	0.001	0.001
	N	11	11	11	11	11	11	11	11	11	11	11	11
ACC2	Pearson Correlation	0.842**	0.246	-0.602	-0.221	-0.317	-0.576	-0.457	-0.229	0.306	0.304	0.817**	0.843**
	Sig. (2-tailed)	0.001	0.466	0.050	0.514	0.343	0.064	0.158	0.498	0.361	0.363	0.002	0.001
	N	11	11	11	11	11	11	11	11	11	11	11	11
ACR1	Pearson Correlation	0.678*	0.495	-0.007	-0.156	-0.082	0.107	-0.190	0.223	0.149	0.181	0.667*	0.541
	Sig. (2-tailed)	0.022	0.122	0.983	0.646	0.811	0.754	0.576	0.510	0.661	0.595	0.025	0.086
	N	11	11	11	11	11	11	11	11	11	11	11	11
ACR2	Pearson Correlation	0.695*	0.365	-0.293	0.014	-0.107	-0.266	-0.078	0.091	0.236	0.516	0.600	0.573
	Sig. (2-tailed)	0.018	0.270	0.381	0.967	0.754	0.429	0.820	0.789	0.485	0.104	0.051	0.065
	N	11	11	11	11	11	11	11	11	11	11	11	11
AST1	Pearson Correlation	1	0.311	-0.496	-0.225	-0.247	-0.363	-0.481	-0.241	0.239	0.357	0.885**	0.838**
	Sig. (2-tailed)	.	0.351	0.121	0.505	0.464	0.272	0.134	0.475	0.478	0.281	0.000	0.001
	N	11	11	11	11	11	11	11	11	11	11	11	11
AST2	Pearson Correlation	0.311	1	0.326	0.088	0.000	0.309	0.198	0.176	0.112	0.365	0.400	0.189
	Sig. (2-tailed)	0.351	.	0.329	0.798	1.000	0.356	0.559	0.605	0.743	0.270	0.223	0.577
	N	11	11	11	11	11	11	11	11	11	11	11	11
COM1	Pearson Correlation	-0.496	0.326	1	0.527	0.731**	0.946**	0.818**	0.496	0.097	0.260	-0.437	-0.601
	Sig. (2-tailed)	0.121	0.329	.	0.096	0.011	0.000	0.002	0.120	0.776	0.440	0.179	0.051
	N	11	11	11	11	11	11	11	11	11	11	11	11
COM2	Pearson Correlation	-0.225	0.088	0.527	1	0.752**	0.511	0.849**	0.478	0.608*	0.700*	-0.327	-0.407
	Sig. (2-tailed)	0.505	0.798	0.096	.	0.008	0.108	0.001	0.137	0.047	0.017	0.326	0.214
	N	11	11	11	11	11	11	11	11	11	11	11	11
COM3	Pearson Correlation	-0.247	0.000	0.731**	0.752**	1	0.671*	0.807**	0.200	0.498	0.649*	-0.289	-0.346
	Sig. (2-tailed)	0.464	1.000	0.011	0.008	.	0.024	0.003	0.555	0.119	0.031	0.389	0.297
	N	11	11	11	11	11	11	11	11	11	11	11	11
CON1	Pearson Correlation	-0.363	0.309	0.946**	0.511	0.671*	1	0.749**	0.562	-0.026	0.273	-0.386	-0.543
	Sig. (2-tailed)	0.272	0.356	0.000	0.108	0.024	.	0.008	0.072	0.940	0.416	0.241	0.084
	N	11	11	11	11	11	11	11	11	11	11	11	11
CON2	Pearson Correlation	-0.481	0.198	0.818**	0.849**	0.807**	0.749**	1	0.590	0.336	0.565	-0.562	-0.674
	Sig. (2-tailed)	0.134	0.559	0.002	0.001	0.003	0.008	.	0.056	0.312	0.070	0.072	0.023
	N	11	11	11	11	11	11	11	11	11	11	11	11

**Correlation is significant at the 0.01 level (2-tailed)
*Correlation is significant at the 0.05 level (2-tailed)

Table 10. Pearson Correlation Matrix for Variables (Section IV)

		AST1	AST2	COM1	COM2	COM3	CON1	CON2	CUR1	CUR2	CUR3	EOU1	EOU2
CUR1	Pearson Correlation	-0.241	0.176	0.496	0.478	0.200	0.562	0.590	1	0.094	0.092	-0.425	-0.584
	Sig. (2-tailed)	0.475	0.605	0.120	0.137	0.555	0.072	0.056	.	0.782	0.789	0.193	0.059
	N	11	11	11	11	11	11	11	11	11	11	11	11
CUR2	Pearson Correlation	0.239	0.112	0.097	0.608*	0.498	-0.026	0.336	0.094	1	0.565	0.231	0.127
	Sig. (2-tailed)	0.478	0.743	0.776	0.047	0.119	0.940	0.312	0.782	.	0.070	0.494	0.710
	N	11	11	11	11	11	11	11	11	11	11	11	11
CUR3	Pearson Correlation	0.357	0.365	0.260	0.700*	0.649*	0.273	0.565	0.092	0.565	1	0.209	0.141
	Sig. (2-tailed)	0.281	0.270	0.440	0.017	0.031	0.416	0.070	0.789	0.070	.	0.538	0.678
	N	11	11	11	11	11	11	11	11	11	11	11	11
EOU1	Pearson Correlation	0.885**	0.400	-0.437	-0.327	-0.289	-0.386	-0.562	-0.425	0.231	0.209	1	0.945**
	Sig. (2-tailed)	0.000	0.223	0.179	0.326	0.389	0.241	0.072	0.193	0.494	0.538	.	0.000
	N	11	11	11	11	11	11	11	11	11	11	11	11
EOU2	Pearson Correlation	0.838**	0.189	-0.601	-0.407	-0.346	-0.543	-0.674	-0.584	0.127	0.141	0.945**	1
	Sig. (2-tailed)	0.001	0.577	0.051	0.214	0.297	0.084	0.023	0.059	0.710	0.678	0.000	.
	N	11	11	11	11	11	11	11	11	11	11	11	11
LOC1	Pearson Correlation	0.488	0.526	-0.003	0.227	0.043	0.047	0.043	0.201	0.363	0.407	0.585	0.498
	Sig. (2-tailed)	0.128	0.096	0.993	0.502	0.899	0.890	0.899	0.554	0.273	0.214	0.059	0.119
	N	11	11	11	11	11	11	11	11	11	11	11	11
LOC2	Pearson Correlation	0.810**	0.411	-0.312	-0.191	-0.129	-0.292	-0.413	-0.367	0.322	0.309	0.967**	0.918**
	Sig. (2-tailed)	0.003	0.209	0.350	0.574	0.706	0.384	0.207	0.267	0.335	0.356	0.000	0.000
	N	11	11	11	11	11	11	11	11	11	11	11	11
MNG1	Pearson Correlation	0.758**	0.308	-0.376	-0.331	-0.235	-0.365	-0.417	-0.157	0.198	0.188	0.805**	0.804**
	Sig. (2-tailed)	0.007	0.357	0.255	0.321	0.487	0.270	0.202	0.645	0.560	0.579	0.003	0.003
	N	11	11	11	11	11	11	11	11	11	11	11	11
MNG2	Pearson Correlation	0.840**	0.343	-0.408	-0.151	-0.202	-0.359	-0.399	-0.169	0.340	0.307	0.896**	0.879**
	Sig. (2-tailed)	0.001	0.301	0.213	0.659	0.551	0.278	0.225	0.619	0.307	0.359	0.000	0.000
	N	11	11	11	11	11	11	11	11	11	11	11	11
PRS1	Pearson Correlation	0.853**	0.088	-0.594	-0.373	-0.334	-0.538	-0.643	-0.419	0.203	0.116	0.922**	0.953**
	Sig. (2-tailed)	0.001	0.797	0.054	0.259	0.316	0.088	0.033	0.200	0.549	0.734	0.000	0.000
	N	11	11	11	11	11	11	11	11	11	11	11	11
PRS2	Pearson Correlation	0.814**	0.183	-0.524	-0.317	-0.398	-0.434	-0.558	-0.141	0.135	0.084	0.858**	0.863**
	Sig. (2-tailed)	0.002	0.591	0.098	0.341	0.225	0.182	0.074	0.678	0.692	0.806	0.001	0.001
	N	11	11	11	11	11	11	11	11	11	11	11	11
LOD1	Pearson Correlation	0.615*	0.649*	-0.178	0.039	-0.169	-0.185	-0.120	-0.200	0.267	0.453	0.654*	0.503
	Sig. (2-tailed)	0.044	0.031	0.600	0.909	0.619	0.587	0.726	0.556	0.426	0.162	0.029	0.115
	N	11	11	11	11	11	11	11	11	11	11	11	11
LOD2	Pearson Correlation	0.662*	0.663*	-0.152	-0.010	-0.278	-0.077	-0.168	0.194	0.179	0.282	0.725**	0.606*
	Sig. (2-tailed)	0.026	0.026	0.656	0.977	0.408	0.823	0.622	0.567	0.598	0.401	0.012	0.048
	N	11	11	11	11	11	11	11	11	11	11	11	11
REL1	Pearson Correlation	-0.408	0.217	0.505	0.563	0.211	0.482	0.676*	0.927**	0.155	0.118	-0.486	-0.618
	Sig. (2-tailed)	0.212	0.522	0.113	0.071	0.533	0.134	0.022	0.000	0.649	0.731	0.130	0.043
	N	11	11	11	11	11	11	11	11	11	11	11	11
REL2	Pearson Correlation	0.654*	0.449	-0.065	-0.291	-0.048	-0.097	-0.285	-0.098	0.306	0.145	0.778**	0.663*
	Sig. (2-tailed)	0.029	0.166	0.849	0.385	0.888	0.777	0.396	0.775	0.360	0.670	0.005	0.026
	N	11	11	11	11	11	11	11	11	11	11	11	11
DV	Pearson Correlation	0.775**	0.217	-0.366	-0.213	-0.173	-0.332	-0.423	-0.104	0.392	0.155	0.835**	0.776**
	Sig. (2-tailed)	0.005	0.521	0.268	0.530	0.611	0.318	0.195	0.760	0.233	0.650	0.001	0.005
	N	11	11	11	11	11	11	11	11	11	11	11	11

**Correlation is significant at the 0.01 level (2-tailed)
*Correlation is significant at the 0.05 level (2-tailed)

Table 11. Pearson Correlation Matrix for Variables (Section V)

		LOC1	LOC2	MNG1	MNG2	PRS1	PRS2	LOD1	LOD2	REL1	REL2	DV
TC1	Pearson Correlation	0.461	-0.030	0.101	0.133	-0.183	0.073	0.282	0.535	0.828**	0.041	0.013
	Sig. (2-tailed)	0.154	0.931	0.768	0.696	0.590	0.831	0.402	0.090	0.002	0.906	0.970
	N	11	11	11	11	11	11	11	11	11	11	11
TC2	Pearson Correlation	0.087	0.189	0.297	0.173	0.130	0.033	-0.028	-0.104	-0.167	0.432	0.309
	Sig. (2-tailed)	0.800	0.577	0.375	0.610	0.703	0.923	0.935	0.760	0.623	0.185	0.355
	N	11	11	11	11	11	11	11	11	11	11	11
TC3	Pearson Correlation	0.045	-0.274	-0.405	-0.338	-0.529	-0.525	-0.064	-0.204	0.349	-0.235	-0.370
	Sig. (2-tailed)	0.897	0.414	0.217	0.309	0.094	0.097	0.851	0.547	0.293	0.488	0.263
	N	11	11	11	11	11	11	11	11	11	11	11
TC4	Pearson Correlation	0.199	-0.234	-0.205	-0.111	-0.329	-0.146	0.043	0.205	0.828**	-0.049	-0.023
	Sig. (2-tailed)	0.558	0.488	0.544	0.745	0.323	0.669	0.899	0.545	0.002	0.887	0.947
	N	11	11	11	11	11	11	11	11	11	11	11
IC1	Pearson Correlation	0.297	0.374	0.188	0.311	0.324	0.295	0.541	0.314	0.040	0.145	0.285
	Sig. (2-tailed)	0.375	0.257	0.580	0.351	0.331	0.379	0.086	0.348	0.908	0.670	0.395
	N	11	11	11	11	11	11	11	11	11	11	11
IC2	Pearson Correlation	0.478	0.463	0.425	0.586	0.532	0.623*	0.464	0.618*	0.214	0.133	0.384
	Sig. (2-tailed)	0.137	0.152	0.193	0.058	0.092	0.041	0.150	0.043	0.528	0.697	0.243
	N	11	11	11	11	11	11	11	11	11	11	11
IC3	Pearson Correlation	0.661*	0.668*	0.542	0.731**	0.679*	0.704**	0.336	0.571	-0.007	0.456	0.751**
	Sig. (2-tailed)	0.027	0.025	0.085	0.011	0.022	0.016	0.312	0.067	0.983	0.158	0.008
	N	11	11	11	11	11	11	11	11	11	11	11
ACC1	Pearson Correlation	0.579	0.861**	0.955**	0.903**	0.876**	0.869**	0.352	0.654*	-0.378	0.877**	0.882**
	Sig. (2-tailed)	0.062	0.001	0.000	0.000	0.000	0.001	0.289	0.029	0.252	0.000	0.000
	N	11	11	11	11	11	11	11	11	11	11	11
ACC2	Pearson Correlation	0.636*	0.826**	0.919**	0.937**	0.877**	0.889**	0.479	0.719**	-0.240	0.701**	0.847**
	Sig. (2-tailed)	0.036	0.002	0.000	0.000	0.000	0.000	0.136	0.013	0.478	0.016	0.001
	N	11	11	11	11	11	11	11	11	11	11	11
ACR1	Pearson Correlation	0.777**	0.700*	0.788**	0.767**	0.586	0.717**	0.210	0.744**	0.052	0.854**	0.835**
	Sig. (2-tailed)	0.005	0.016	0.004	0.006	0.058	0.013	0.536	0.009	0.880	0.001	0.001
	N	11	11	11	11	11	11	11	11	11	11	11
ACR2	Pearson Correlation	0.612*	0.653*	0.820**	0.795**	0.659*	0.750**	0.513	0.748**	0.098	0.590	0.649*
	Sig. (2-tailed)	0.045	0.029	0.002	0.003	0.028	0.008	0.107	0.008	0.773	0.056	0.031
	N	11	11	11	11	11	11	11	11	11	11	11
AST1	Pearson Correlation	0.488	0.810**	0.758**	0.840**	0.853**	0.814**	0.615*	0.662*	-0.408	0.654*	0.775**
	Sig. (2-tailed)	0.128	0.003	0.007	0.001	0.001	0.002	0.044	0.026	0.212	0.029	0.005
	N	11	11	11	11	11	11	11	11	11	11	11
AST2	Pearson Correlation	0.526	0.411	0.308	0.343	0.088	0.183	0.649*	0.663*	0.217	0.449	0.217
	Sig. (2-tailed)	0.096	0.209	0.357	0.301	0.797	0.591	0.031	0.026	0.522	0.166	0.521
	N	11	11	11	11	11	11	11	11	11	11	11
COM1	Pearson Correlation	-0.003	-0.312	-0.376	-0.408	-0.594	-0.524	-0.178	-0.152	0.505	-0.065	-0.366
	Sig. (2-tailed)	0.993	0.350	0.255	0.213	0.054	0.098	0.600	0.656	0.113	0.849	0.268
	N	11	11	11	11	11	11	11	11	11	11	11
COM2	Pearson Correlation	0.227	-0.191	-0.331	-0.151	-0.373	-0.317	0.039	-0.010	0.563	-0.291	-0.213
	Sig. (2-tailed)	0.502	0.574	0.321	0.659	0.259	0.341	0.909	0.977	0.071	0.385	0.530
	N	11	11	11	11	11	11	11	11	11	11	11
COM3	Pearson Correlation	0.043	-0.129	-0.235	-0.202	-0.334	-0.398	-0.169	-0.278	0.211	-0.048	-0.173
	Sig. (2-tailed)	0.899	0.706	0.487	0.551	0.316	0.225	0.619	0.408	0.533	0.888	0.611
	N	11	11	11	11	11	11	11	11	11	11	11
CON1	Pearson Correlation	0.047	-0.292	-0.365	-0.359	-0.538	-0.434	-0.185	-0.077	0.482	-0.097	-0.332
	Sig. (2-tailed)	0.890	0.384	0.270	0.278	0.088	0.182	0.587	0.823	0.134	0.777	0.318
	N	11	11	11	11	11	11	11	11	11	11	11
CON2	Pearson Correlation	0.043	-0.413	-0.417	-0.399	-0.643	-0.558	-0.120	-0.168	0.676*	-0.285	-0.423
	Sig. (2-tailed)	0.899	0.207	0.202	0.225	0.033	0.074	0.726	0.622	0.022	0.396	0.195
	N	11	11	11	11	11	11	11	11	11	11	11

**Correlation is significant at the 0.01 level (2-tailed)

*Correlation is significant at the 0.05 level (2-tailed)

Table 12. Pearson Correlation Matrix for Variables (Section VI)

		LOC1	LOC2	MNG1	MNG2	PRS1	PRS2	LOD1	LOD2	REL1	REL2	DV
CUR1	Pearson Correlation	0.201	-0.367	-0.157	-0.169	-0.419	-0.141	-0.200	0.194	0.927**	-0.098	-0.104
	Sig. (2-tailed)	0.554	0.267	0.645	0.619	0.200	0.678	0.556	0.567	0.000	0.775	0.760
	N	11	11	11	11	11	11	11	11	11	11	11
CUR2	Pearson Correlation	0.363	0.322	0.198	0.340	0.203	0.135	0.267	0.179	0.155	0.306	0.392
	Sig. (2-tailed)	0.273	0.335	0.560	0.307	0.549	0.692	0.426	0.598	0.649	0.360	0.233
	N	11	11	11	11	11	11	11	11	11	11	11
CUR3	Pearson Correlation	0.407	0.309	0.188	0.307	0.116	0.084	0.453	0.282	0.118	0.145	0.155
	Sig. (2-tailed)	0.214	0.356	0.579	0.359	0.734	0.806	0.162	0.401	0.731	0.670	0.650
	N	11	11	11	11	11	11	11	11	11	11	11
EOU1	Pearson Correlation	0.585	0.967**	0.805**	0.896**	0.922**	0.858**	0.654*	0.725**	-0.486	0.778**	0.835**
	Sig. (2-tailed)	0.059	0.000	0.003	0.000	0.000	0.001	0.029	0.012	0.130	0.005	0.001
	N	11	11	11	11	11	11	11	11	11	11	11
EOU2	Pearson Correlation	0.498	0.918**	0.804**	0.879**	0.953**	0.863**	0.503	0.606*	-0.618	0.663*	0.776**
	Sig. (2-tailed)	0.119	0.000	0.003	0.000	0.000	0.001	0.115	0.048	0.043	0.026	0.005
	N	11	11	11	11	11	11	11	11	11	11	11
LOC1	Pearson Correlation	1	0.707**	0.665*	0.765**	0.486	0.635*	0.291	0.809**	0.232	0.638*	0.736**
	Sig. (2-tailed)	.	0.015	0.026	0.006	0.130	0.036	0.386	0.003	0.493	0.035	0.010
	N	11	11	11	11	11	11	11	11	11	11	11
LOC2	Pearson Correlation	0.707**	1	0.850**	0.935**	0.903**	0.860**	0.584	0.753**	-0.381	0.827**	0.868**
	Sig. (2-tailed)	0.015	.	0.001	0.000	0.000	0.001	0.059	0.007	0.247	0.002	0.001
	N	11	11	11	11	11	11	11	11	11	11	11
MNG1	Pearson Correlation	0.665*	0.850**	1	0.935**	0.857**	0.897**	0.331	0.726**	-0.197	0.881**	0.896**
	Sig. (2-tailed)	0.026	0.001	.	0.000	0.001	0.000	0.320	0.011	0.562	0.000	0.000
	N	11	11	11	11	11	11	11	11	11	11	11
MNG2	Pearson Correlation	0.765**	0.935**	0.935**	1	0.914**	0.947**	0.483	0.828**	-0.200	0.806**	0.915**
	Sig. (2-tailed)	0.006	0.000	0.000	.	0.000	0.000	0.133	0.002	0.556	0.003	0.000
	N	11	11	11	11	11	11	11	11	11	11	11
PRS1	Pearson Correlation	0.486	0.903**	0.857**	0.914**	1	0.943**	0.465	0.638*	-0.483	0.713**	0.850**
	Sig. (2-tailed)	0.130	0.000	0.001	0.000	.	0.000	0.150	0.035	0.132	0.014	0.001
	N	11	11	11	11	11	11	11	11	11	11	11
PRS2	Pearson Correlation	0.635*	0.860**	0.897**	0.947**	0.943**	1	0.412	0.799**	-0.209	0.722**	0.873**
	Sig. (2-tailed)	0.036	0.001	0.000	0.000	0.000	.	0.208	0.003	0.537	0.012	0.000
	N	11	11	11	11	11	11	11	11	11	11	11
LOD1	Pearson Correlation	0.291	0.584	0.331	0.483	0.465	0.412	1	0.627*	-0.154	0.316	0.287
	Sig. (2-tailed)	0.386	0.059	0.320	0.133	0.150	0.208	.	0.039	0.651	0.344	0.392
	N	11	11	11	11	11	11	11	11	11	11	11
LOD2	Pearson Correlation	0.809**	0.753**	0.726**	0.828**	0.638*	0.799**	0.627*	1	0.196	0.635*	0.679*
	Sig. (2-tailed)	0.003	0.007	0.011	0.002	0.035	0.003	0.039	.	0.563	0.036	0.022
	N	11	11	11	11	11	11	11	11	11	11	11
REL1	Pearson Correlation	0.232	-0.381	-0.197	-0.200	-0.483	-0.209	-0.154	0.196	1	-0.175	-0.194
	Sig. (2-tailed)	0.493	0.247	0.562	0.556	0.132	0.537	0.651	0.563	.	0.606	0.567
	N	11	11	11	11	11	11	11	11	11	11	11
REL2	Pearson Correlation	0.638*	0.827**	0.881**	0.806**	0.713**	0.723**	0.316	0.635*	-0.175	1	0.887**
	Sig. (2-tailed)	0.035	0.002	0.000	0.003	0.014	0.012	0.344	0.036	0.606	.	0.000
	N	11	11	11	11	11	11	11	11	11	11	11
DV	Pearson Correlation	0.736**	0.868**	0.896**	0.915**	0.850**	0.873**	0.287	0.679*	-0.194	0.887**	1
	Sig. (2-tailed)	0.010	0.001	0.000	0.000	0.001	0.000	0.392	0.022	0.567	0.000	.
	N	11	11	11	11	11	11	11	11	11	11	11

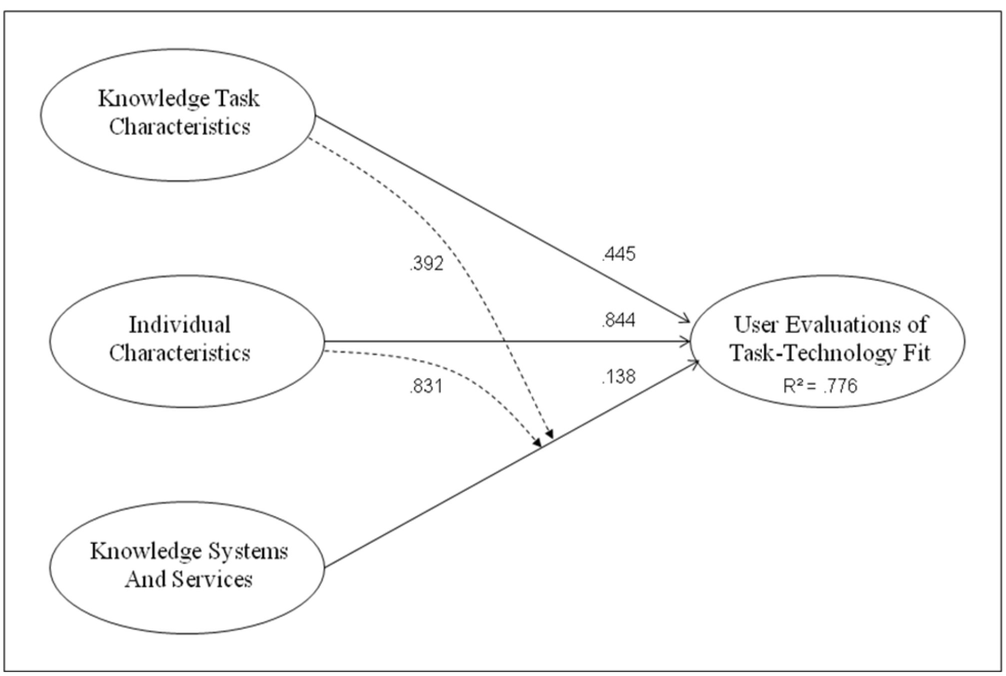
**Correlation is significant at the 0.01 level (2-tailed)
*Correlation is significant at the 0.05 level (2-tailed)

significant negative relationships between items. This is consistent with the intended positive answers of the true value of the survey questions. A more reliable scale correlation would entail changing the polarity of some of the questions on subsequent

survey evaluations (Goodhue, 1998). There are several significant positive correlations observed in the correlation matrix. Results suggest as accessibility and assistance increase accuracy also increases, and as compatibility issues increase confusion increases. There is a positive correlation ease of use, locatability, meaning, presentation, level of detail and reliability that indicates an increase in one construct can increase the others. This study is limited in its statistical power by the small sample size, so further research with a larger N could show differences in correlations.

Reliability

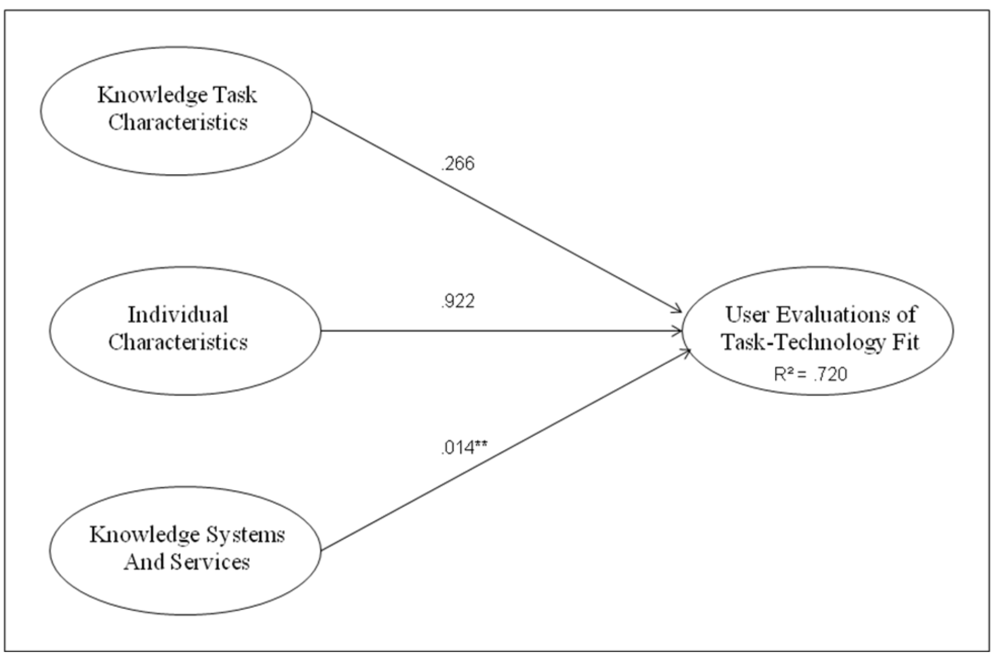
The degree of consistency between multiple measurements of a variable will test the reliability of a model. The model was run twice, once with the moderating paths, and once without. The numbers on the path indicate the p-valve and the percent of variation



**Correlation is significant at the 0.01 level (2-tailed)
*Correlation is significant at the 0.05 level (2-tailed)

Figure 2 – P-Values for the Knowledge TTF Model (with moderators)

explained by the model (R^2) is presented below the dependent variable. The p-value, or observed significance level, represents the probability of obtaining subsequent results the same as the one observed (Hair et al, 2006). Significant p-values are identified by a ** (0.01 level) or a * (0.05 level). The model with the moderators (Figure 2) showed no significance levels and 77.6 percent of the variation explained by the model. The model without the moderators (Figure 3) showed significance between the knowledge systems and services and user evaluation and 72 percent of the variation explained by the model. This shows that knowledge systems and services is a strong predictor of user evaluation, and any change in systems and services will show a change in the user evaluation. With a larger sample (N) other paths may be statistically significant.



**Correlation is significant at the 0.01 level (2-tailed)
*Correlation is significant at the 0.05 level (2-tailed)

Figure 3 – P-Values for the Knowledge TTF Model (without moderators)

Open-Ended Survey Questions

To minimize the bias of pre-determined agree-disagree responses, open-ended questions were included in the ETF evaluation survey (Myers and Newman, 2006). Table 12 presents a synopsis of the participants' responses. The content of the ETF was geared more toward QASAS personnel working in the in the field, so its usefulness in a classroom was not as relevant to the student participants. There were positive reviews on the transcripts, videos, and knowledge nugget views within the ETF. Training in the use of the ETF and trust in the expert's experiences were found lacking, as well as including more applicable content to the role of the student in the classroom setting. Technical issues in this study included video buffering lag and some views that did not open. This

Table 13. Opened-Ended Question Responses

Is the system something you would find useful in the classroom?	It would be more useful if it had 'in depot' content
	I'm not going overseas for quite some time, so it isn't very useful
	It would be useful if the instructors would be the interviewees
Would you use this type of system to find information and knowledge when you are in the real world?	I would use it if I had a question that I couldn't get the answer to
What did you like about it?	I thought the transcripts were easy to use
	The videos were good to use
	The nugget view was best
What did you not like about it?	I needed more training first to learn how to use everything
	The views were not as good as a simple search
	I didn't pay attention to whether they were vetted or not (at least 3 people said this)
	I took the information at face value
What features or enhancements might make you like it better?	I would like more in-CONUS content
	It would be better if the instructors were the interviewees
Technical Issues?	Buffering lag…it took a long time for the video to load and they were often choppy
	Some of the videos did not work at all
	Some of the views would not open

may be due to the bandwidth available to the online ETF access. This study is limited in its statistical power by the small sample size, so further research with a larger N could show a wider range of answers and viewpoints.

Chapter Overview

The data suggests that the theory behind the TTF model is sound and the wording of the questions describe our participant's tasks sufficiently. The correlation between the knowledge systems and services correlate and show significance with the user evaluation. While our findings are limited by its small-scale nature, our findings are promising enough to warrant a full-scale study. Now we will finish the study describing our limitations and recommendations for future research.

V. Discussion

Our proposition states the ETF fits the problem-solving tasks assigned to students in the DAC classroom environment. Students evaluated the ETF using scenarios that ranged from simple to complex decision-making tasks. Within the confines of a scenario-based exercise using the ETF, the user evaluations were favorable for solving the problems. When asked if the ETF would be useful outside the classroom, the answers were constrained by the specific content of the knowledge within the ETF. Because of the small number of participants and the specific nature of the ETF content, it would be statistically challenging to generalize our findings throughout the organization without a full-scale study with larger number of participants and more variety of decision makers. Preliminary findings suggest that further study is warranted. This small-scale study also allowed us to determine evaluation process roadblocks like technical issues, video buffering lag, and evaluator training that can be mitigated within a full-scale implementation.

Qualitative Findings

When asked if they would find the ETF useful in the classroom, the participants felt the use of the ETF was more suited to the field environment. To be more useful in the classroom, they suggested having more "in depot" content. Since the ETF was populated with field QASAS knowledge content, it would be hard to evaluate its use in the classroom setting for the current course topics and curriculum offerings. The scenario exercises the participants were administered were developed using the current knowledge content of the ETF.

The participants were asked if they would use the ETF to find information and knowledge when in the real work environment (non-student). The answers suggested they would only use the ETF if they had a question for which they could not get the answer. Suggestions for more frequent use of the system include increasing the knowledge content to hold not only hard to find answers and experiences, but also day-to-day work processes, plans, and knowledge. This would allow for workers to help continuously corroborate and update the knowledge, build a trust of the system and its content, and feel more comfortable using the system during normal and difficult decision-making.

The positive review of the ETF included easy to use transcripts, helpful videos, and informative knowledge nugget views. Negative reviews included ETF training, searching using the views, interviewee selection, and knowledge vetting. More comprehensive training on the use ETF and features that aid the user in decision-making will make the user feel more comfortable using the ETF and trust in the integrity of the knowledge contents. Three out of eleven participants felt that expert vetting is an important aspect in their decision to trust knowledge enough to use in the course of their problem-solving issues. Continuous knowledge vetting with other experts in the field can build the users trust in the currency and accuracy of the knowledge. The participants felt interviewing their instructors and "nuggetizing" their expert knowledge would be beneficial.

Technical issues in this study included video buffering lag and some views that did not open. The DAC and base installation workers share a 4-Megabyte network connection line that limits the bandwidth and slows some of the more graphically intense

aspects of the ETF. It may be beneficial to invest in a larger throughput connectivity that would address this issue. Further evaluation of the ETF would benefit from testing the system in a variety of network environments to ensure optimal compatibility with a variety of bandwidths, web browsers, hardware, and operating systems. Overall, this qualitative data allowed further clarification on possible evaluation process roadblocks like technical issues, video buffering lag, and evaluator training that can be mitigated within a full-scale implementation.

Limitations

Consideration of and reduction of possible sources of error is important in a strong research design. This research is limited because it focuses on student evaluations of a knowledge transfer system in a controlled small-scale, scenario-based environment. This study is a step in evaluating the ETF, and works toward evaluations by established expert QASAS personnel in real life decision-making tasks. The current content within the ETF focuses on a particular subset of people within DAC, so it would be difficult to general our findings outside of that group of people.

A small sample size, while acceptable for a pilot study, does not allow for statistically robust findings. In small sample research, the sophistication and complexity of the multivariate technique may easily result in either "(1) too little statistical power for the test to realistically identify significant results or (2) too easily over fitting the data such that the results are artificially good because they fit the sample, yet provide no generalizability" (Hall et al, 2006). The small sample size of this study limits the

statistical power and generalizability, so further research with a larger N could show differences in research findings.

Recommendations for Future Study

Expanding the knowledge content within the ETF will allow for a broader expanse of topic areas that will appeal to a more dynamic audience. Using a wider range (and larger amount) of people during real-life decision-making processes will most likely show stronger significance to the TTF survey. A more robust evaluation of the ETF using the TTF model would have not only QASAS personnel but also representative participants from all areas within the DAC organization. Randomly selecting participants from distinct groups within the organization will guard against sample bias.

When the TTF model was designed, the preponderance of information systems consisted of mainframes and networked PCs. With the ubiquitous use of the Internet and overall computer literacy of the average worker, there may be a shift in assessing relevant information systems (Goodhue, 1998). Possible future research can include reassessing the TTF model for today's workforce and decisions made with current information technologies.

Conclusions

Our overall findings suggest confirmation of the majors parts of the model utilized but we cannot be comfortable suggesting other findings since our statistical power was low due to a small number of participants. Because of the small N and the specific nature of the ETF content, it would be statistically challenging to generalize our findings throughout the organization without further research that consisted of a full-scale

study with a larger number of participants and more variety of decision makers. The preliminary findings suggest a good fit between the ETF and problem-solving tasks assigned to students in the DAC classroom environment. The participants offered the following insights:

- The ETF was more suited to the field environment because of the knowledge content
- They would only use the ETF if they had a question they could not get the answer to
- The ETF transcripts, videos, and nugget views were easy to use
- There should be more training on the use of the ETF
- Searching using the views was not as easy as a simple keyword search
- Expert vetting would enhance the currency and trust in the knowledge
- Interviewing instructors instead of and/or in addition to the field experts
- Technical issues in this study included video buffering lag and some views that did not open

The small number of participants and the particular knowledge content of the ETF allowed for a precise testing of our proposition but limited the generalizability of implementing a full-scale evaluation organization-wide. The data suggests some support for our research and does not contradict the model. Overall, the findings from this study suggest when populated with current and applicable knowledge, the ETF is a viable tool.

Appendix A: Survey Evaluation on the Expertise Transfer Forum

Part I.

Task-Technology Fit Questions by Construct

Rate the following using a 7-point scoring (1 = Strongly Disagree; 4 = Neither Agree nor Disagree; 7 = Strongly Agree)

<u>Knowledge Task Characteristics</u>

- The ammunition problems I deal with frequently involve more than one group.
- I frequently deal with ad hoc, non-routine (complex) ammunition problems.
- Frequently the ammunition problems I work on involve answering questions that have never been asked in quite that form before.
- The problems I deal with frequently involve more than one ammunition function.

<u>Individual Characteristics</u>

- I feel comfortable writing simple computer applications.
- I feel comfortable generating unique computer reports.
- I feel comfortable creating computer spreadsheets.

<u>Knowledge Systems and Services</u>

Accessibility

- I can get knowledge quickly and easily when I need it.
- It is easy to get access to the knowledge that I need.

Accuracy

- The knowledge that I use or would like to use is accurate enough for my purposes.
- There are accuracy problems in the knowledge I use or need.

Assistance

- I am getting the help I need in accessing and understanding knowledge tool(s).
- It is easy to get assistance when I am having trouble finding or using knowledge.

Compatibility

- There are times when supposedly equivalent information from two different sources is inconsistent.
- Sometimes it is difficult or impossible to compare or aggregate knowledge from two different sources because the meaning is interpreted differently.
- When it is necessary to compare or aggregate knowledge from two or more different sources, there may be unexpected or difficult inconsistencies.

Confusion

- There are so many different knowledge tools, each with slightly different meaning that it is hard to understand which one to use in a given situation.
- The knowledge is stored in so many different places and in so many forms, it is hard to know how to use it effectively.

Currency

- I can't get knowledge that is current enough to meet my needs.
- The knowledge is up-to-date enough for my purposes.
- I need some knowledge on the up-to-the-minute status of operations or events but cannot get it.

Ease of Use of Hardware and Software

- The knowledge tool(s) are convenient and easy to use.
- It is easy to learn how to use the knowledge tool(s).

Locatability

- It is easy to locate knowledge on a particular issue, even if I haven't used that knowledge before.
- It is easy to find out what knowledge is maintained on a given subject.

Meaning

- On the knowledge tool(S) in use, the exact meaning of information elements is either obvious, or easy to find out.
- The exact definition of knowledge fields relating to my task are easy to find out.

Presentation

- The knowledge is presented in a readable and useful format.
- The knowledge that I need is displayed in a readable and understandable form.

Right Level of Detail

- Sufficiently detailed knowledge is maintained by the knowledge tool(s).
- The knowledge tool(s) maintain knowledge at an appropriate level of detail for my purposes.

System Reliability

- The knowledge tool(s) are subject to frequent system problems and crashes.
- I can count on the tool(s) to be "up" and available when I need them.

<u>Overall</u>

- The overall knowledge tools I have used meet my training needs.

Part II.

Semi-Structured Interview Questions

- Is the system something you would find useful in the classroom?
- Would you use this type of system to find information and knowledge when you are in the real world?
- What did you like about it?
- What did you not like about it?
- What features or enhancements might make you like it better?
- Were there any technical issues?

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Vita

Master Sergeant Daphne R. McGill graduated from Richardson High School in Richardson, Texas in May 1986. She enlisted in the Air Force in 1990 and attended basic training at Lackland AFB, Texas. She spent eight years learning her skills as a medical technician at Yokota Air Base, Japan, and Lackland AFB, Texas. During her time at Lackland AFB, she deployed to Guantanamo Bay, Cuba, to provide medical care to over 10,000 Cuban refugees.

In 1998, she attended the Independent Duty Medical Technician (IDMT) School in Sheppard AFB, Texas with a follow-on assignment to the new 15th Reconnaissance Squadron (RQ-1 Predators) in Indian Springs Air Force Auxiliary Field, Nevada. She deployed multiple times with her Predator squadron to Kuwait and Pakistan. In 2004, she was assigned as part of the Squadron Medical Element team of the 32nd Air Refueling Squadron at McGuire AFB, New Jersey, where she deployed to the United Arab Emirates with her KC-10 squadron. During that deployment, she completed her BS degree in Information Technology. She was then assigned to the 305th Medical Group as the IDMT Program Manager and Air Mobility Command's (AMC) Global Reach Laydown (FFGRL) Pilot Unit POC. She co-coordinated the 2001 and 2007 Joint IDMT/Navy IDC Symposiums in Las Vegas, and was named the 2006 AMC IDMT of the Year. In August 2007, she entered the Graduate School of Engineering and Management at the Air Force Institute of Technology to pursue a MS degree in Information Resource Management. Upon graduating, she will be assigned to the Air Force Medical Operations Agency in San Antonio, Texas in the Education and Training department.

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14. ABSTRACT
Organizations today are using information technology to capture knowledge from experts and disseminate this knowledge to decision makers. Having the right information to the right person at the right time facilitates more effective and efficient decisions. This study uses Goodhue's (1998) Task-Technology Fit (TTF) theoretical model to evaluate an Expertise Transfer Forum (ETF) developed by the Oklahoma State University for the Defense Ammunition Center's quality assurance personnel. The preliminary findings suggest a good fit between the ETF and problem-solving tasks assigned to students in the DAC classroom environment. The participants also offered the following observations:

- The ETF was more suited to the field environment because of the knowledge content
- They would only use the ETF if they had a question they could not get the answer to
- The ETF transcripts, videos, and nugget views were easy to use
- There should be more training on the use of the ETF
- Searching using the views was not as easy as a simple keyword search
- Expert vetting would enhance the currency and trust in the knowledge
- Interviewing instructors instead of and/or in addition to the field experts
- Technical issues in this study included video buffering lag and some views that did not open

Because of the small N and the specific nature of the ETF content, there was not enough statistical power to generalize our findings. Overall, the findings from this study suggest when populated with current and applicable knowledge, the ETF is a viable tool.

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